Colour of Celestine

SOME months ago, through the good offices of Mr. B. Topley, of Messrs. Albright and Wilson, Oldbury, we obtained several specimens of celestine from near Yate, Glos. Some were colourless, others tinged with blue, whilst a few were red. The blue crystals have been observed locally to occur lining channels or 'pipes' where water has bored through the massive mineral; the particular conditions favouring the red crystals are not apparently known.

The blue colour, to which celestine owes its name, is usually attributed to traces of vivianite, which possesses deep pigmentary power¹. This, however, can scarcely explain the red colour.

Doelter² attributed the colours of celestine and numerous other minerals to the presence of colloidal inclusions, the degree of dispersion of which would determine the colour, whilst the concentration would determine the depth of that colour. He suggested, further, that the blue colour of celestine might be caused by colloidal sulphur produced by reduction of some of the sulphate.

Spectrograms of our specimens showed that whilst only minute traces of iron were present, the characteristic lines of gold were well defined in the red and blue specimens, but were scarcely perceptible in the white. The gold was extracted with aqua regia, reduced with phenyl hydrazine³ and weighed on a sintered glass funnel using a microbalance. The iron was determined colorimetrically.

The results were as follows:

	Gold (p.p.m.)	Iron (p.p.m.)
Colourless crystals	nil*	19
Fale blue "	49	4
Deep red "	85	4

* Too small to extract.

It is noteworthy that the iron content was greatest in the colourless crystals, whilst the gold content rose with the depth of colour. When gently heated, the blue crystals became slightly pink, but the other crystals were unchanged.

We are inclined to the opinion, therefore, that the colours of our specimens are due to colloidal gold. We should like to examine specimens from other localities but are experiencing great difficulty in obtaining them; perhaps some readers of NATURE could help to obtain specimens.

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Sept. 7.

¹ Dana, "Descriptive Mineralogy", 906 (1914). Miers, "Mineralogy", 589 (1929).

² Doelter, "Die Farben der Mineralien" (1915).

³ Using Pozzi-Escot's method of reduction (*Ann. Chim. Anal.*, 12, 90 (1907)).

Vitamin B₁ and Acetate Oxidation by Bacteria

IT is now known¹ that vitamin B₁ may be a necessary factor for the growth of bacteria. Bacteria can, however, be grown with minimal amounts of vitamin B₁ and such bacteria (for example, *Staphylococcus aureus*) may show enhanced metabolic activities so far as the breakdown of pyruvic acid is concerned, when the vitamin is added to suspensions of the washed cells². If the bacteria are grown on a medium containing adequate quantities of vitamin B₁, the subsequent addition of the vitamin to the washed cells does not affect their metabolic changes.

It is evident that a study of the action of vitamin B₁ on the chemical changes brought about by vitamin B₁-deficient bacteria may throw new light on the mechanism of action of this vitamin.

So far, attention has been mainly concerned with the effects of vitamin B₁ on pyruvic acid and lactic acid breakdown, following the work of Peters and his colleagues on the effects of this vitamin on the metabolism of avitaminous pigeon brain.

Werkman and his colleagues³ have found that the growth and metabolism of propionic acid bacteria are affected by the presence of vitamin B₁.

We have found, using a washed suspension of propionic acid bacteria grown on a vitamin B₁-deficient medium, that the addition of the vitamin very markedly stimulates the oxidation of acetic acid.

Acetic acid is already known from the work of Stone, Wood and Werkman⁴ to act as a hydrogen donor in the presence of the resting cells of propionic acid bacteria.

A typical result illustrating the action of vitamin B₁ on acetate oxidation is shown by the following figures, obtained with a suspension of bacteria grown on a vitamin B₁-deficient medium and incubated aerobically in a phosphate medium (in a Barcroft differential respiratory apparatus) at 37° for two hours:

Substance added to bacterial suspension	μl oxygen consumed	μl oxygen consumed, due to the acetate	μl acetate utilized
No addition	197	—	—
0.25 γ vitamin B ₁ ..	245	—	—
0.01 M acetate	563	366	193
0.25 γ vitamin B ₁ + 0.01 M acetate ..	1202	957	486

The following conclusions may be drawn. (1) In the presence of very small quantities of vitamin B₁ (for example, 0.08×10^{-3} mgm. per ml.) there is a very marked stimulation of the oxygen uptake in the presence of acetate, though not in the absence of the added substrate. This stimulation is not due to an increase in the number of bacteria during the course of the experiment as cell counts have shown. (2) The ratio of oxygen uptake to acetate utilized is approximately 2.0 and this ratio appears to be independent of the addition of vitamin B₁. The ratio of 2.0 would be expected if complete oxidation of acetate occurred according to the following equation

and estimations of carbon dioxide (or bicarbonate) formation have been consistent with this conclusion.

It would be a plausible view that the catalytic action of the vitamin is due to its accelerative effect on the oxidation of pyruvic acid possibly formed as an intermediate during the oxidation of acetic acid. Against this view, however, is the experimental fact that no pyruvic acid appears to accumulate when the acetate is oxidized by the bacteria in the absence of the added vitamin. Moreover, a ratio considerably less than 2.0 would be expected if acetate were oxidized in the absence of vitamin B₁ to an intermediate the further oxidation of which required the presence of the vitamin. Experiment has failed to show that traces of pyruvic acid block the aerobic oxidation of acetic acid. The inference would be that the acetic acid molecule itself, in the case at any rate of propionic acid bacteria, requires the presence of